

PATENT ABSTRACTS OF JAPAN

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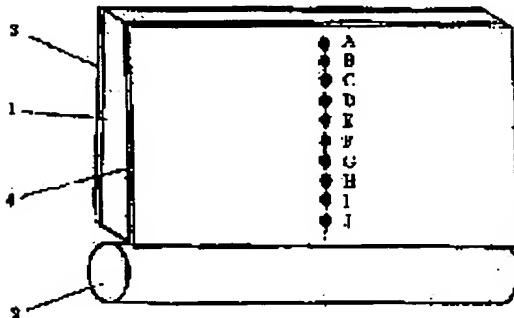
(21)Application number : **2001-060065** (71)Applicant : **MITSUBISHI RAYON CO LTD**

(22)Date of filing : **05.03.2001** (72)Inventor : **MASUDA SEIJI**
NAKANISHI HIROSHI

(54) METHACRYLIC RESIN COMPOSITION AND LIGHT GUIDE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a methacrylic resin composition which is suitable for producing a back light of a homogeneous liquid crystal display exhibiting a high luminance and a low unevenness in luminance.



SOLUTION: This resin composition comprises a methacrylic resin and fine particles having a refractive index different from that of the resin. The composition contains, per g of it, 100,000-1,000,000 fine particles having sizes of 0.5-1.0 μm .

[Claim(s)]

[Claim 1] Methacrylic resin and it are a methacrylic resin constituent which contains per 1g of resin constituents, and 100,000 - 1 million particles with a particle size of 0.5-1.0 micrometers in the methacrylic resin constituent containing the particle from which a refractive index differs.

[Claim 2] The methacrylic resin constituent according to claim 1 whose particle is one sort chosen from the group which consists of a silica, titanium oxide, a barium sulfate, a calcium carbonate, methacrylic resin, styrene resin, and silicone resin, or two sorts or more.

[Claim 3] The transparent material which consists of an acrylic resin constituent according to claim 1.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the acrylic resin constituent for a transparent material and transparent materials.

[0002]

[Description of the Prior Art] In recent years, in a portable notebook computer, the portable liquid crystal TV, the video one apparatus liquid crystal TV, a car-navigation system, etc. equipped with the liquid crystal display, what has the high definition CRT (cathode ray tube) average is required, and the uniform back light is needed by high brightness. Moreover, in these equipments, in order that a liquid crystal display may account for the quite big rate of power consumption, it has been an important technical problem about dc-battery actuation time amount, to stop as low as possible the power consumption of the surface light source equipment for liquid crystal displays, when raising practical use worth of the product [a stretch and / itself]. However, in having reduced the brightness of the surface light source, in order to stop the power consumption of surface light source equipment, a liquid crystal display becomes hard to see and is not desirable. Then, in order to stop power consumption, without sacrificing the brightness of the surface light source, the ingredient development for raising the optical property of the surface light source is called for.

[0003] It is divided roughly into the thing of the direct lower part type which arranges the light source of a fluorescent lamp etc. under the liquid crystal panel, and the edge light method using the transparent material which has arranged the light source on the side face as structure of such the surface light source. Among these, although it had the description that the surface light source is miniaturizable, by the edge light method, it had the fault that brightness was low as compared with a direct lower part type, and was not what can fully cope with a technical problem called high-definition-izing of a liquid crystal display, and power-saving. By preparing a printing layer, the split-face section, etc. which were formed on the surface of the transparent material by such edge light

method When the light which spreads the inside of a transparent material reached a printing layer, the split-face section, etc., an echo or dispersion took place, in order to decrease a part of light which carried out incidence by repeating an echo inside a transparent material, outgoing radiation of no light which carried out incidence was carried out, but the utilization effectiveness of light was falling.

[0004] Then, the method of adding the inorganic particle and the organic particle to which a refractive index differs from transparency resin, making light scattering cause inside a transparent material, and carrying out outgoing radiation of the incident light efficiently into the transparency resin which constitutes a transparent material, is proposed. However, when an inorganic particle and an organic particle are added in this way, in order for these diffusion particle itself to absorb the light of a light region, light transmission fell and there was a fault that high brightness was not obtained.

[0005] For example, in JP,5-16002,B, the optical diffusion plate which did 1-50 mass % addition of a spherical silicone particle with a mean particle diameter of 0.3-10 micrometers is proposed. Moreover, in JP,6-324215,A, the transparent material to which the refractive-index difference with the mean particle diameter of 0.1-50 micrometers and base material resin added the particle of 0.02-0.2 is proposed.

[0006] On the other hand, in JP,10-265530,A, the transparent material which used the acrylic resin whose 0.5-25-micrometer minute particle is 10,000 or less per polymer 1g is proposed.

[0007]

[Problem(s) to be Solved by the Invention] However, when the resin constituent proposed in JP,5-16002,B is used for the transparent material of an edge light method and a thing silicone particle is added more than 1 mass %, the rate of the light scattered about near the light source increases too much, the rate of the light penetrated to a transparent material edge decreases, and there is a trouble of being inferior to the homogeneity of the brightness as the surface light source.

[0008] Moreover, according to the formula the resin constituent proposed in JP,6-324215,A is indicated to be there, it is supposed that 10 ppm or more need to add a diffusion particle also at the lowest, since this also has too many additions of a diffusion particle, its rate of the light scattered about near the light source increases too much, its rate of the light penetrated to a transparent material edge decreases, and it is inferior to the homogeneity of the brightness as the surface light source.

[0009] When the light which spreads the inside of a transparent material as mentioned above in very few resin constituents of the particle number proposed in JP,10-265530,A on the other hand reached a printing layer, the split-face section, etc., an echo or dispersion took place, in order to decrease a part of light which carried out incidence by repeating an echo inside a transparent material, outgoing radiation of no light which carried out incidence was carried out, but the utilization effectiveness of light was falling.

[0010]

[Means for Solving the Problem] this invention person etc. reaches this invention, as a result of examining the transparent material for the surface light sources wholeheartedly in view of such a situation.

[0011] That is, this invention is a methacrylic resin constituent per 1g of resin constituents, and containing 100,000 - 1 million particles with a particle size of 0.5-1.0 micrometers in the methacrylic resin constituent with which methacrylic resin and it contain the particle from which a refractive index differs. It is desirable that it is one sort chosen from the group which consists of a silica, titanium oxide, a barium sulfate, a calcium carbonate, methacrylic resin, styrene resin, and silicone resin as a particle, or two sorts or more.

[0012] Moreover, another this invention is a transparent material which consists of the above-mentioned methacrylic resin constituent.

[0013]

[Embodiment of the Invention] In this invention, the resin of methacrylic resin which says the polymer which includes a methyl-methacrylate unit as the configuration unit more than 70 mass %, and consists below of 30 mass % a methyl methacrylate and more than copolymerizable monomeric unit 0.2 mass % below 99.8 mass % more than methyl-methacrylate unit 70 mass % is desirable. As a methyl methacrylate and a copolymerizable monomer A methyl acrylate, an ethyl acrylate (meta), butyl acrylate (meta), Acrylic-acid cyclohexyl, 2-ethylhexyl acrylate (meta), (Meta) Acrylic-acid phenyl, acrylic-acid (meta) benzyl, acrylic-acid (meta) 2-hydroxyethyl, (Meta) Acrylic ester (meta) other than methyl methacrylates, such as metaglycidyl acrylate and an acrylic-acid (meta) diethylaminoethyl; Ethylene GURIKORUJI (meta) acrylate, (Meta) TORIMECHI roll pro pantry (meta) acrylate, allyl compound (meta) acrylate, Polyfunctional (meta) acrylate, such as neopentyl GURIKORUJI (meta) acrylate; maleimide; maleic anhydrides, such as aromatic series vinyl monomers; phenyl maleimide, such as styrene and alpha methyl styrene, and cyclohexyl maleimide, etc. can be illustrated.

[0014] Moreover, the resin containing the copolymer which carried out the graft of the copolymer which uses methacrylic ester as a principal component to the rubber-like copolymer which uses acrylic ester as a principal component for the purpose of the shock-proof improvement in methacrylic resin can also be used.

[0015] In this invention, it is important to combine the particle to which a refractive index differs from methacrylic resin in the above-mentioned methacrylic resin, when attaining the object of this invention. Here, the difference of a refractive index says a certain thing that refractive indexes differ 0.01 or more. A certain thing of the difference of a refractive index is [0.02 or more] desirable. When the difference of a refractive index is less than 0.01, the effectiveness of light scattering of a particle is small and sufficient amount of Idemitsu is hard to be obtained. Especially as a particle used, although not limited, it is desirable to use one sort chosen from the group which consists of a silica, titanium oxide,

a barium sulfate, a calcium carbonate, methacrylic resin, styrene resin, and silicone resin, or two sorts or more.

[0016] As for the mean particle diameter of the particle used by this invention, it is desirable that it is the range of 0.5-1.0 micrometers. When this has too small particle diameter, it is for the effectiveness as a light diffusion agent to fall, and when particle diameter is too large, it is to be easy to produce muddiness in a resin constituent, and for the utilization effectiveness of light to fall.

[0017] The thing in the range whose particle size is 0.5-1.0 micrometers among particles is 100,000-1 million per 1g of resin constituents, and the addition to the methacrylic resin of a particle is 150,000-500,000 pieces preferably. By making the content of the particle in the above-mentioned size range or more into 100,000 per 1g of resin constituents, sufficient optical diffusibility is acquired and brightness can fully be raised. Moreover, sufficient light transmission can be obtained by carrying out to 1 million or less per 1g of resin constituents. In order to make the content of a particle with a particle size [per 1g of resin constituents] of 0.5-1.0 micrometers into a specific amount, after measuring the particle size distribution of a particle beforehand, it is desirable to decide the amount of the particle added to resin. Little direction of the content of a particle smaller than 0.5 micrometers and a larger particle than 1.0 micrometers is desirable. The content of the particle in a methacrylic resin constituent is suitably chosen in this range according to the magnitude of the surface light source, thickness, the number of the light sources, arrangement that are used and that are used, etc. In addition, the number of the particles in the range whose particle size is 0.5-1.0 micrometers shall irradiate laser light at the solution which dissolved the acrylic resin constituent in solvents, such as dichloromethane, and shall say the value calculated by the approach of detecting the scattered light.

[0018] Although especially the configuration of a particle is not limited, it is desirable that they are the shape of an ellipse globular form and a real ball configuration, and it is desirable that it is a configuration near especially a real ball configuration or this. When manufacturing a transparent material by the injection-molding method especially, since it may lifting-come to be easy of orientation and a stacking tendency unique as a transparent material may be produced at the time of injection molding, in the shape of a rod, or a tabular thing, it is desirable that they are a real ball configuration or a configuration near this.

[0019] Although not limited especially about the addition approach to the methacrylic resin of a particle, homogeneity can be made to distribute a particle in methacrylic resin by mixing the methacrylic resin and the particle of the shape of a pellet type or a bead, for example, and kneading using an extruder. Kneading especially using a twin screw extruder is desirable from the point of homogeneity diffusion of a particle. When it is easy to produce brightness nonuniformity as the surface light source when distribution of a particle is uneven, and manufacturing a transparent material by the injection-molding method, they are a lifting and a cone in poor shaping, such as a silver streak.

[0020] The transparent material of this invention can fabricate and manufacture the mixture of methacrylic resin and a particle by injection molding, extrusion molding, etc. which carry out melting kneading and are generally used.

[0021] When making the transparent material of this invention into the transparent material for the surface light sources, it can consider as the thing of various configurations, such as a thing of the wedge configuration to which thickness becomes thin gradually, and a thing to which thickness becomes thin gradually toward both the light source side of a 2 LGT type to a center section, from the thing [of a sheet configuration with uniform thickness], and light source side of a 1 LGT type. Moreover, in order to make more outgoing radiation light distribution from a transparent material into homogeneity, the ink of white or a translucent color is used for the outgoing radiation side of a transparent material, a dot-like pattern can be printed or concavo-convex processing of the shape of the shape of a crimp and a dot etc. can also be performed.

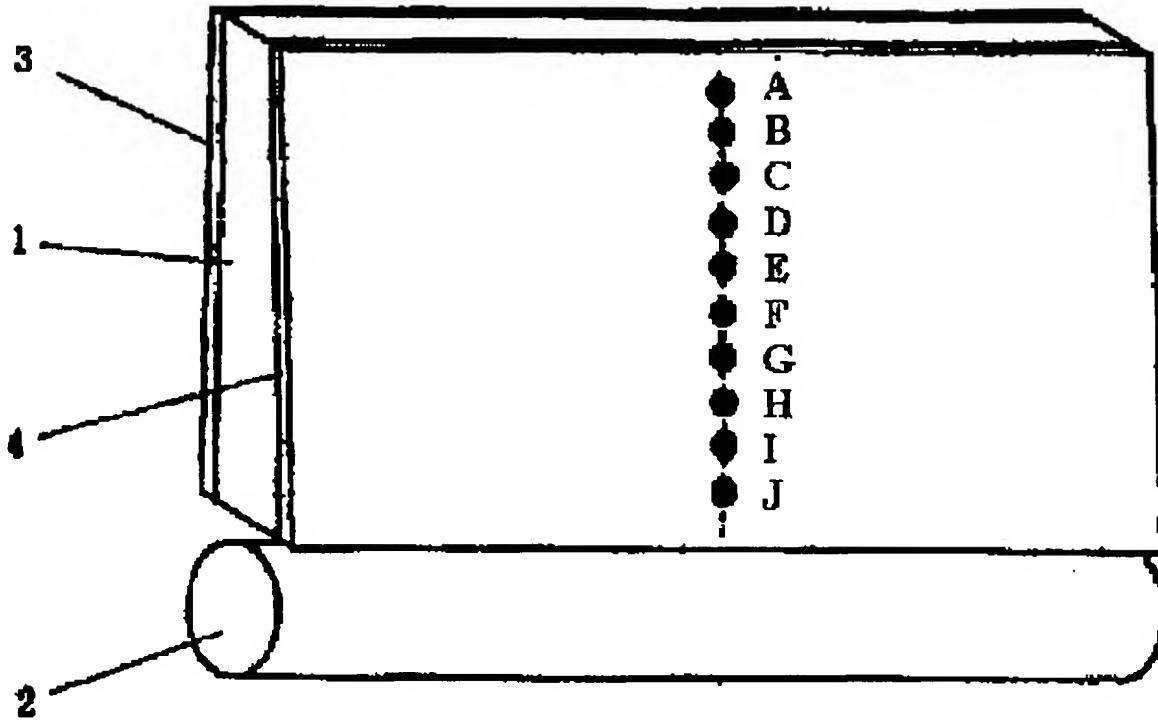
[0022]

[Example] Hereafter, an example explains this invention concretely.

[0023] The dispersing agent (particle) shown in a table 1 was added in examples 1-8, the example 1 of a comparison, and the 2 methacrylic-resin (AKURI pet VH 5 000, trade name, Mitsubishi Rayon Co., Ltd. make) 100 mass section, and kneading extrusion and the extruded strand were pelletized with the extruder (PCM45, a trade name, IKEGAI Make) in them using the pelletizer in the barrel temperature of 240 degrees C, the dice temperature of 240 degrees C, and screw-speed 200rpm.

[0024] Thus, 0.1g of obtained methacrylic resin constituents was dissolved in dichloromethane, and the particle diameter which exists in 1g of resin constituents measured the particulate number which is 0.5-1.0 micrometers using MODEL4100 made from HIAC/ROYCO.

[0025] The transparent material of the wedge configuration whose opposite hand the thickness of ON **** is 2.0mm and is 0.6mm by ON **** 220x width of face of 200mm about the methacrylic resin pellet containing this dispersing agent using an injection molding machine (IS220FB-10Y, a trade name, Toshiba Machine Co., Ltd. make) was fabricated with the cylinder temperature of 260 degrees C, and the die temperature of 80 degrees C. White ink was used for one field of the obtained transparent material, the dot pattern was printed, the reflective film was turned on the printing side side, and the laminating of the diffusion film was carried out to the reverse side. Furthermore, the fluorescent lamp was installed in the thick thick end face, and the back light of structure as shown in drawing 1 was constituted.



Drawing 1

[0026] The brightness of the outgoing radiation light from the diffusion film plane of the obtained back light was measured by ten points of A-J sequentially from the location distant from the light source, as shown in drawing 1, the average was made into average luminance, and it was shown in a table 1 by making the minimum brightness / the maximum brightness in ten points into brightness nonuniformity. Spacing between measuring-point A-J was set up in the direction with a die length of 200mm by 10mm unit, and an A point, an end face and J point, and an end face were taken as spacing of 5mm, respectively. Luminance-meter LS-100 by Minolta Camera Co., Ltd. were used for the measurement of luminance.

[0027] The transparent material was obtained like the example except not using example of comparison 3 dispersing agent. Using the obtained transparent material, the back light was constituted like the example, the measurement of luminance was performed, and average luminance and brightness nonuniformity were shown in a table 1.

[0028]

[A table 1]

	導光体			バックライト性能	
	拡散剤	濃度 (万個/g)	平均粒径 (μm)	平均輝度 (Cd/m ²)	輝度ムラ (%)
実施例1	硫酸バリウム	80	0.7	1400	80
実施例2	硫酸バリウム	15	1.0	1500	85
実施例3	炭酸カルシウム	70	0.5	1300	70
実施例4	シリカ	20	0.5	1450	80
実施例5	酸化チタン	25	0.5	1500	85
実施例6	酸化チタン	50	0.5	1400	80
実施例7	シリコンビーズ	75	0.8	1250	75
実施例8	スチレンビーズ	30	0.8	1350	80
比較例1	硫酸バリウム	500	0.7	950	35
比較例2	炭酸カルシウム	300	0.5	1000	40
比較例3	なし	1.5	-	1000	80

[0029]

[Effect of the Invention] By constituting a transparent material using the methacrylic resin constituent which carried out the amount content of specification of the particle of specific magnitude, by high brightness, the uniform back light with little brightness nonuniformity could be offered, and high-definition-izing of a liquid crystal display and power-saving have been attained.

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